

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claim 21 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The claim includes the limitation that the powder includes no boric oxide. No support for this limitation can be found in the specification or the original claims.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-8 rejected under 35 U.S.C. 102(b) as being anticipated by Beall in US6541407.

Beall teaches a cordierite porous body, comprising at least Si as a chemical component. This body is formed by mixing quartz with a source of talc, alumina and kaolin, as well as methyl

cellulose. These chemicals are kneaded together and then extruded in the form of a honeycomb structural body (which is a continuous forming process). The formed mass is then dried and fired. The structure of Beall is said to be useful as a diesel particulate filter (see Abstract).

In reference to Claims 1-3 and 7-8: Beall discloses a ceramic porous body comprising 12.32-22.04 wt % silica, alumina, kaolin, talc and methyl cellulose (**Relevant to Claim 7**). This composition was mixed thoroughly and then extruded into a honeycomb structure, and subsequently dried and fired at 1400+ degrees Celsius (See Column 8, lines 43-64; **Relevant to Claim 8**). It is interesting to note that the compositions and ratios of precursors used by Beall in his Inventive and Comparative Examples in Tables B, C and D, as well as the processing conditions outlined are extremely similar in all respects to that of the instant specifications. It is noted that the examples as outlined in Column 8 of Beall that the final product is of cordierite, meaning that the silica (quartz) was melted in the process and formed cordierite. Seeing that cordierite was formed (**Relevant to Claim 3**) from precursors, which didn't include cordierite, several of the components had to have melted to form cordierite (**Relevant to Claim 2**). As can be seen in Table D, the percent porosity of tested monoliths D1-D3 have a porosity of between 49.4-52.4%. The source of the porosity is immaterial in this situation. The porosity of Beall's body falls within the range expressed in the claims.

In reference to Claims 4-6: These claims are directed towards limitations regarding the silica source used to make the ceramic porous body, which is the object of the claims and therefore are not further limiting. As stated explicitly in Claim 2, the silica source is melted in the process of

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making the ceramic porous body, meaning that in the ceramic porous body the silica source is no longer present as a silica powder. Therefore, the source of silica is immaterial when looking at the final product, which is the ceramic porous body, since the silica is no longer present and is formed into cordierite. The cordierite body of Beall is thus substantially the same as that of the instant claims in its final form, since these claims do not further limit the final cordierite body.

“[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.” In re Thorpe, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). Please See MPEP 2113

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.

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4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).
- 6.
7. Claims 1-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beall in 6,541,407 in view of Swanson in 5,976478.

Beall teaches a method for forming a cordierite porous body, comprising at least Si as a chemical component. This body is formed by mixing quartz with a source of talc, alumina and kaolin, as well as methyl cellulose (a water absorbing agent). These chemicals are kneaded together and then extruded in the form of a honeycomb structural body (which is a continuous forming process). The formed mass is then dried and fired. The structure of Beall is said to be useful as a diesel particulate filter (see Abstract).

The difference between the instant claims and the teaching of Beall arise from the silicon source used in forming the structural body. Beall uses quartz in his examples, where the instant claims use amorphous silica gel with distinct properties regarding its pore and particle size distribution;

however, this difference is resolved by Swanson, who teaches the use of a stringently tested silica particulate, which has high porosity (See Example, Column 6). Due to the porosity of this silica, Swanson deems it as useful in catalyst monoliths (where a honeycomb particulate filter is a well known monolith). Furthermore, Beall at column 7 line 65 through column 8 line 10 does not limit his invention solely to quartz, but also includes non-crystalline silica as possible sources. The use of Swanson's (silica gel) would enhance the porosity of the already porous monolith, increasing its usefulness. One of ordinary skill in the art of making particulate filters would readily see the motivation in using any of the silica powders (whether Inventive or Comparative) to make a better ceramic porous body. This is due to the fact that each source independently suggests possible combination of subject matter. As stated previously, Beall suggests other useful non-crystalline sources, which would include the particles of Swanson and Swanson suggests use in a catalytic monolith, where Beall teaches a method of forming a catalytic monolith in the form of a honeycomb monolith. Based on these two statements, one would find that the particles of Swanson would be useful in the invention of Beall and would have a reasonable expectation of success when incorporating such particles.

In reference to Claims 1-3 and 7-8: Beall discloses a ceramic porous body comprising 12.32-22.04 wt % silica, alumina, kaolin, talc and methyl cellulose (**Relevant to Claim 7**). This composition was mixed thoroughly and then extruded into a honeycomb structure, and subsequently dried and fired at 1400+ degrees Celsius (See Column 8, lines 43-64; **Relevant to Claim 8**). It is interesting to note that the compositions and ratios of precursors used by Beall in his Inventive and Comparative Examples in Tables B, C and D, as well as the processing

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conditions outlined are extremely similar in all respects to that of the instant specifications. It is noted that the examples as outlined in Column 8 of Beall that the final product is of cordierite, meaning that the silica (quartz) was melted in the process and formed cordierite. Seeing that cordierite was formed (**Relevant to Claim 3**) from precursors, which didn't include cordierite, several of the components had to have melted to form cordierite (**Relevant to Claim 2**).

However, as stated above the silica containing component powder of Beall is not a porous silica-containing compound powder. As stated above it would have been obvious to replace the quartz powder, with the porous silica powder of Swanson, due to the reasons stated above. As can be seen in Table D, the percent porosity of tested monoliths D1-D3 have a porosity of between 49.4-52.4%. The source of the porosity is immaterial in this situation. The porosity of Beall's body falls within the range expressed in the claims (**Relevant to Claim 1**).

In reference to Claims 4-6: The powder of Swanson, which would have been an obvious replacement for the quartz of Beall's composition has very refined structure and particle size. This silica, which can be found in Tables 1 and 3, is amorphous in nature, porous, and has a density of .35 to .83 g/cc.

In reference to Claims 9, 10, 14-15: The instant claims are directed towards a ceramic porous body comprising a Si chemical component, wherein, the silica in this scenario is added in the form of silica gel. However, the powder of Swanson, which is used to replace the quartz of Beall, is deemed to be structurally synonymous with silica gel. This is due to the fact that silica gel is characterized by being a highly porous silica powder with a high surface area. Thus the

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powder of Swanson is synonymous with the instantly claimed silica gel, which is an obvious improvement over the quartz powder used by Beall. Furthermore, as was stated before the powder of Swanson is structurally equivalent to the instantly claimed silica gel, which is supported by the fact that the properties of both powders are the same. More specifically Swanson's powders A, C and D found in Table 1 and 3 has a D10/D50 and D90/D50 ratio falling within the ranges recited in **Claim 10**, in Swanson's Disclosure D16 and D84 are recorded rather than D10 and D90; however, particles at D10 are smaller than those at D16 as particles at D84 are smaller than D90 meaning that the ratios of these measurements would still fall well within the limits of the ratios as claimed. All of Swanson's example powders also have a D50 particle size between 10 and 100 microns (**Relevant to Claim 9**). Furthermore, powders A and B also have BET specific surface area of 221 and 382 m²/g, respectively (**Relevant to Claim 14**). Swanson's particles are made of only a silica source and b₂O₃ or boric acid, where the boric acid is later removed. They are therefore substantially pure and contain no metallic impurities (See Column 4, lines 29-38; **Relevant to Claim 15**).

In reference to Claims 11-12: The particles of Swanson are not investigated as far as their geometry is concerned, but it is believed that they would have been spherical or nearly spherical based on the fact that they were created from a normal commercially available powder. Furthermore, if the aspect ratio of the particles were greater than 5, the measurement of the particle diameters would have been very different and would have seen a much greater range. This is due to the fact that the particles were measured by laser light scattering. If the aspect ratio was very high, this method would have given a much broader range of results due to the

fact that the major and minor axis would be included in the calculation (See Table 1). Lastly, in relation to Claim 12 it can be seen in Table 1 that the maximum particle size was 105 microns, where 84% of the particles were under 31 or 23 microns in either case. This means that very few of the particles were over 100 microns. This means that the powder does not substantially include particles greater than 100 microns in diameter.

In reference to Claims 13-14: The comparative examples of Swanson are also structurally synonymous with silica gel, as they have high porosity and pore volume. For this reason, they would be equally suitable in a porous ceramic body. These comparative powders have pore volumes of .55 -1.12 cc/g and surface areas between 195.8-552 cubic meters per gram (See Table 2 in Column 8). These powders as stated by structurally synonymous to silica gel and one of ordinary skill in the art would have viewed them as obvious improvements over the non-porous quartz as used by Beall for the reasons stated previously.

In reference to Claims 16-18: The porous silica made by Swanson is stated as being filtered after creation (Column 6, Lines 22-28); however the filtering process isn't described to a great extent and the pores in the filtering paper are not disclosed. The claim language including this filtering step is deemed to be product-by-process language. In the case of the instant claims, the product as claimed is deemed to be the same product as that of Beall in view of Swanson. The particle size distribution and the ratios as claimed are the same as the powder as taught by Swanson. For this reason, the claim language does not give any patentable distinction, as

Swanson's particles are still filtered or sieved and the final product is the same as the claimed powder.

Regarding Claim 19-20: As previously discussed Beall in view of Swanson teaches a method of producing a cordierite formed product, a honeycomb filter, by adding silica gel granules to a water absorbing polymer (methyl cellulose) to form a clay, which is then extruded (a continuous forming process) to make a honeycomb monolith and fired (See Examples, Column 8 of Beall).

Regarding Claim 21: As previously discussed Beall in view of Swanson teaches a method of producing a cordierite formed product, a honeycomb filter, by adding silica gel granules to a water absorbing polymer (methyl cellulose) to form a clay, which is then extruded (a continuous forming process) to make a honeycomb monolith (See Examples, Column 8 of Beall). The boric oxide used in producing the silica powder of Swanson is said to be readily removed by washing with water. This process of washing is shown in Example 1 in lines 14-16 of Column 6, where it is stated that the boric oxide is isolated from the SiO₂ by agitating at an elevated temperature. Thus the powder of Swanson is substantially free of boric oxide as necessitated by the claim. Furthermore, it can be seen in Table 1 of the same column shows the bulk density of the powders, where the density is .38 and .35 for the two example powders. As stated previously and as seen in Table D of Beall, the monoliths of Swanson use less than 40% silica in their precursors.

Response to Arguments

8. Applicant argues that the Beall reference cannot anticipate the feature of the claim stating that the partition walls having pores and porosity of at least 40% said pores being formed mainly by virtue of a porous silica powder. As was stated in the current rejection, the fact that the porosity of the instant claims is “mainly by virtue of a porous silica powder” is immaterial. The body is a cordierite body where the silica has been melted to form cordierite as stated in claims 2 and 3. Therefore, the porosity and properties of the precursor powder is irrelevant based on the fact that Beall creates substantially the same article, having the claimed amount of porosity, and the claimed composition. Therefore, even in view of the new rejection, such an argument is unconvincing.

9. Applicant's arguments filed 4/23/2008 and directed towards claims 19-21 have been fully considered but they are not persuasive. The examiner has fully explained the reason why one of ordinary skill in the art would combine the two disclosures. Both teachings exclusively lend themselves to combination, where Beall states that other non-crystalline silica can be used as a siliceous source, and Swanson states the usefulness of his particles in forming a catalytic monolith, where a honeycomb structure is a very well known monolith in the art. Therefore, based on these statements in the teachings of the two references, one of ordinary skill in the art would have a reasonable expectation of success in incorporating the silica of Swanson into the monolith of Beall, thus making the instant claims obvious. Finally, in regards to the argument for new claim 21, the particles of Swanson indeed contain substantially no boron as the compound boric oxide is washed from the particles post-synthesis as can be seen in column 4,

lines 30-40 and column 6 lines 13-16. This washing process removes the boric oxide making the silica substantially free of boron. Finally, although not directly of relevance in the current rejection, applicant argues that the particles of Swanson substantially include particles greater than 100 microns. Referring to Table 1 of Swanson, he includes measurements at d16, d50 d84 and dmax. D84 has a radius of 31 or 23 microns depending on whether one is looking at powder a or powder b. Dmax in either case is 105. based on the distribution, 84% of the particles are 23 microns or less. Meaning that only 16% of the particles populate the broad range of sizes from 23.1 microns to 105 microns. Based on the distribution, the particles must Be substantially free of particles greater than 100 microns. The amount of particles greater than 100 microns could not be a substantial amount relative to the population.

10. Applicant argues that the Beall reference cannot anticipate the feature of the claim stating that the partition walls having pores and porosity of at least 40% said pores being formed mainly by virtue of a porous silica powder. As was stated in the current rejection, the fact that the porosity of the instant claims is "mainly by virtue of a porous silica powder" is immaterial. The body is a cordierite body where the silica has been melted to form cordierite as stated in claims 2 and 3. Therefore, the porosity and properties of the precursor powder is irrelevant based on the fact that Beall creates substantially the same article, having the claimed amount of porosity, and the claimed composition.

11. Regardless, the composition of a silica powder used to make a cordierite body is not a limitation, which should be given patentable weight as far as the actual cordierite body goes. The cordierite body is formed regardless of the specific identity of the precursor, as these

precursors are melted. On the contrary, such a limitation would be given patentable weight in a claim directed towards a method.

Conclusion

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew Hoban whose telephone number is (571) 270-3585. The examiner can normally be reached on Monday to Friday 8:00am-4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jerry Lorengo can be reached on 571-272-1233. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jerry A Lorengo/

Supervisory Patent Examiner, Art Unit 1793